



Remedial biology

Unit – 2ND

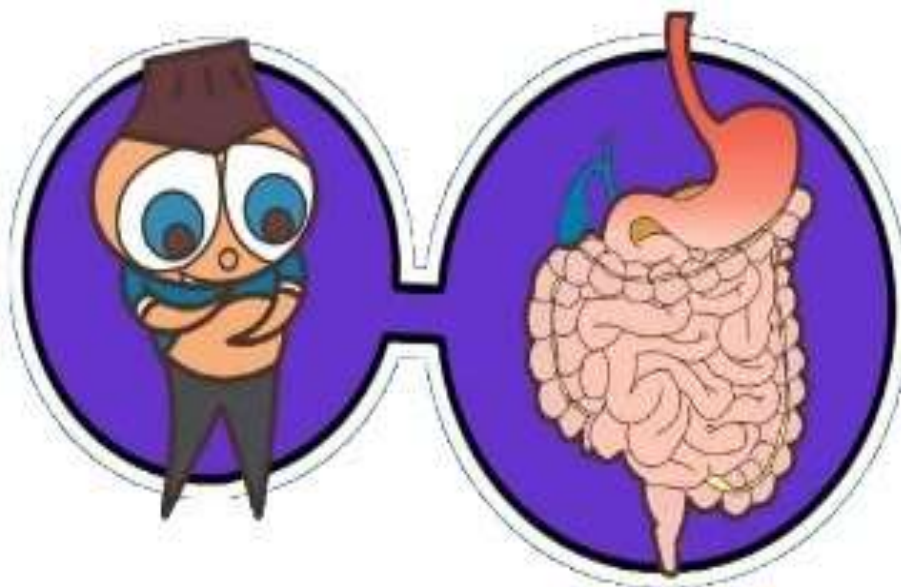
(DIGESTION & ABSORPTION)

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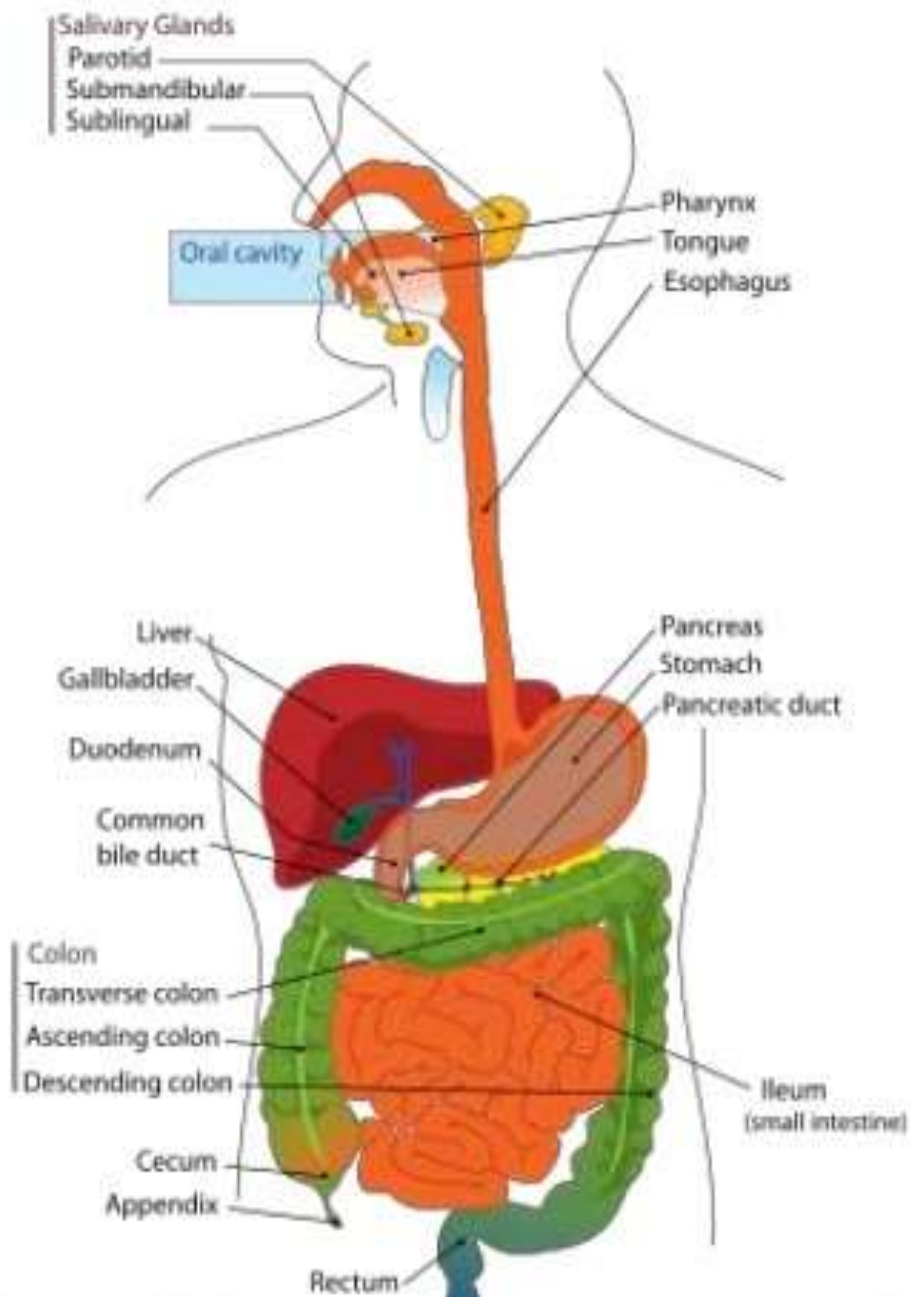
**DIGESTION
AND
ABSORPTION**

DIGESTION

- The process of conversion of complex food substances to simple absorbable form is called **digestion**.



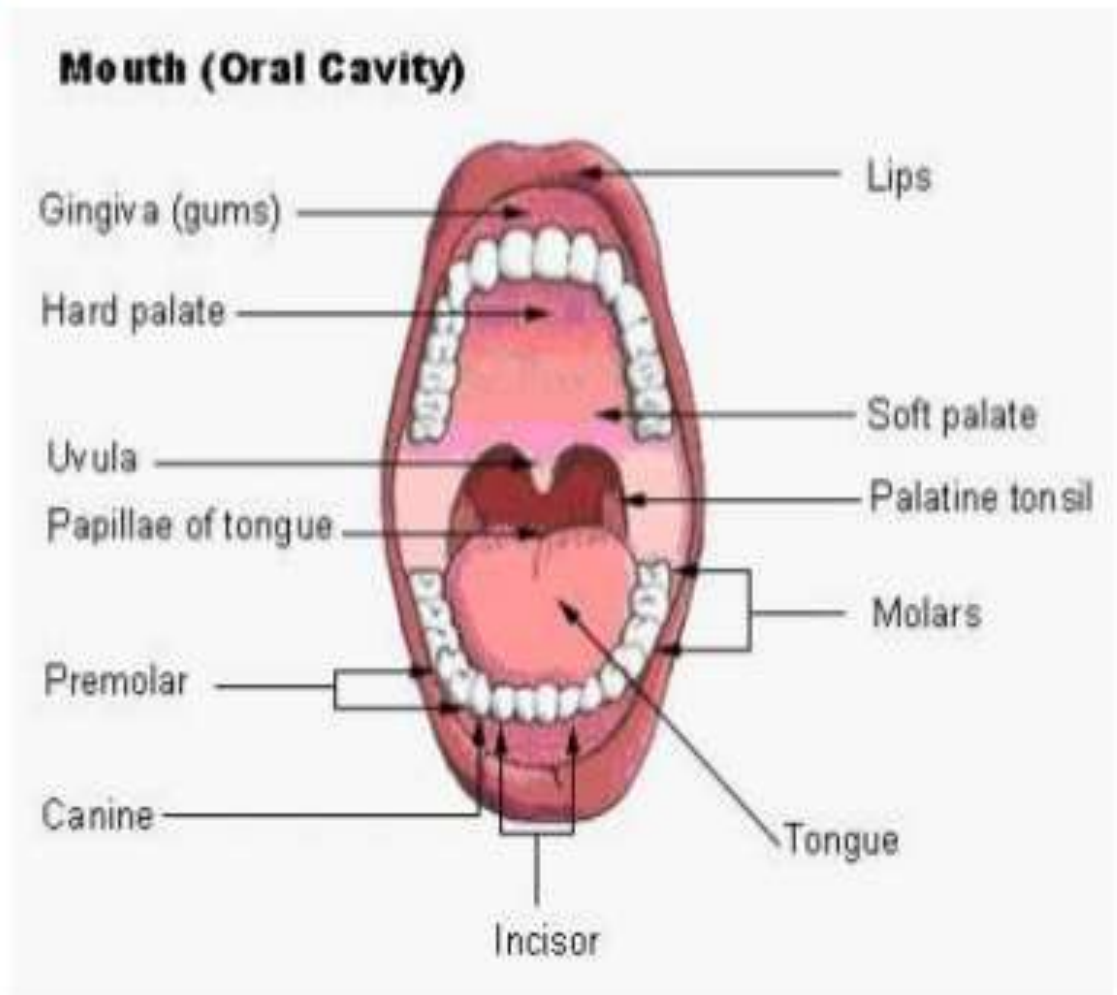
HUMAN DIGESTIVE SYSTEM



Alimentary canal
Associated glands

ORAL CAVITY (BUCCAL CAVITY)

- Teeth
- Tongue
- Palate(roof)



DENTAL FORMULA

The kind and number of teeth are explained in the form of formula is called dental formula.

- Adult 32 permanent teeth

- Incisors 2/2

- Canine 1/1

- Premolars 2/2

- Molars 3/3

- Child 20 milk teeth

- Incisors 2/2

- Canine 1/1

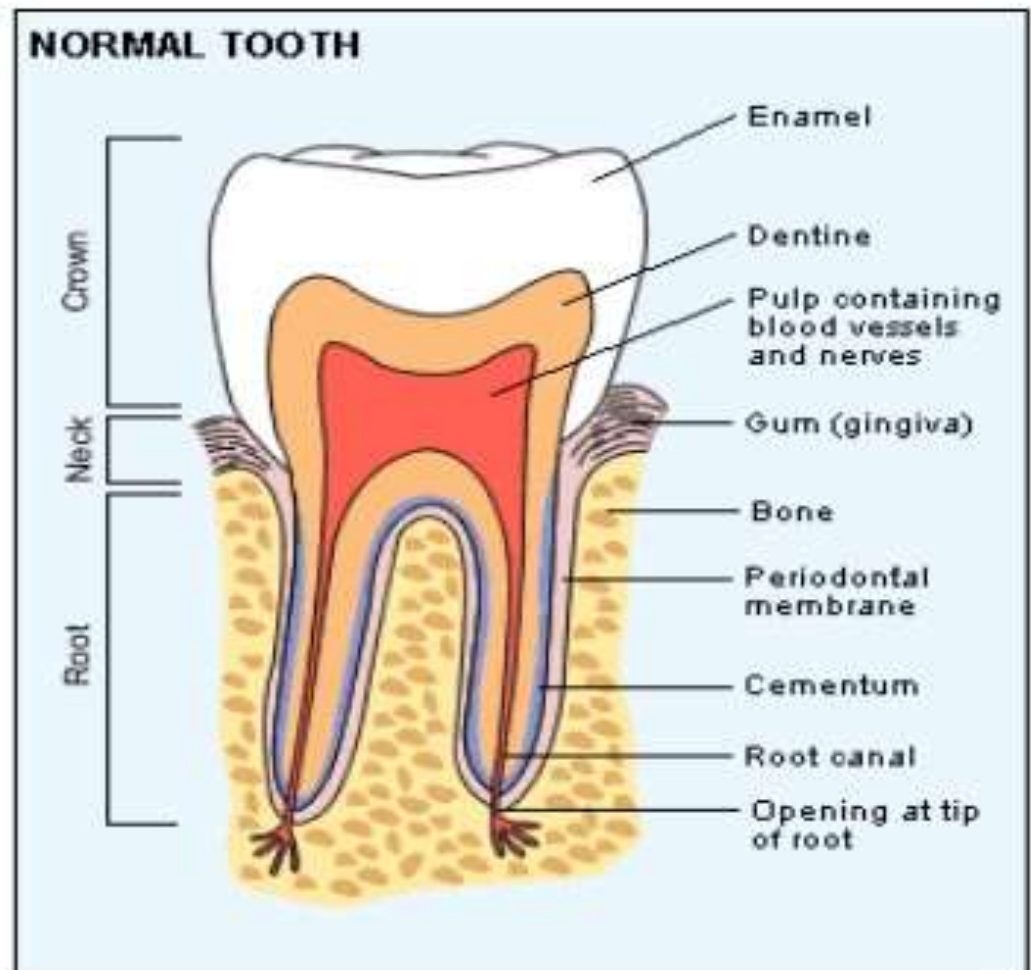
- Premolars 0/0

- Molars 2/2

STRUCTURE OF TOOTH

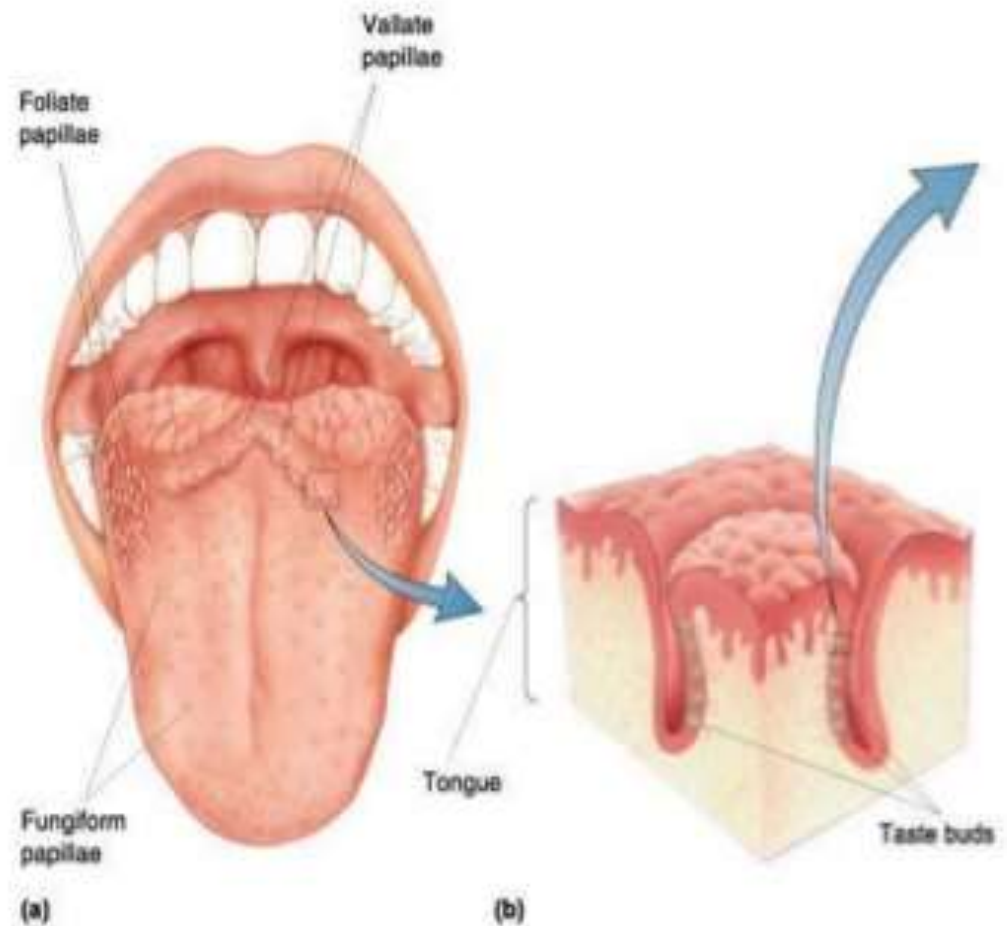
Crown
Neck
Root

Odontoblast
Found in the dental
pulp secrete dentine



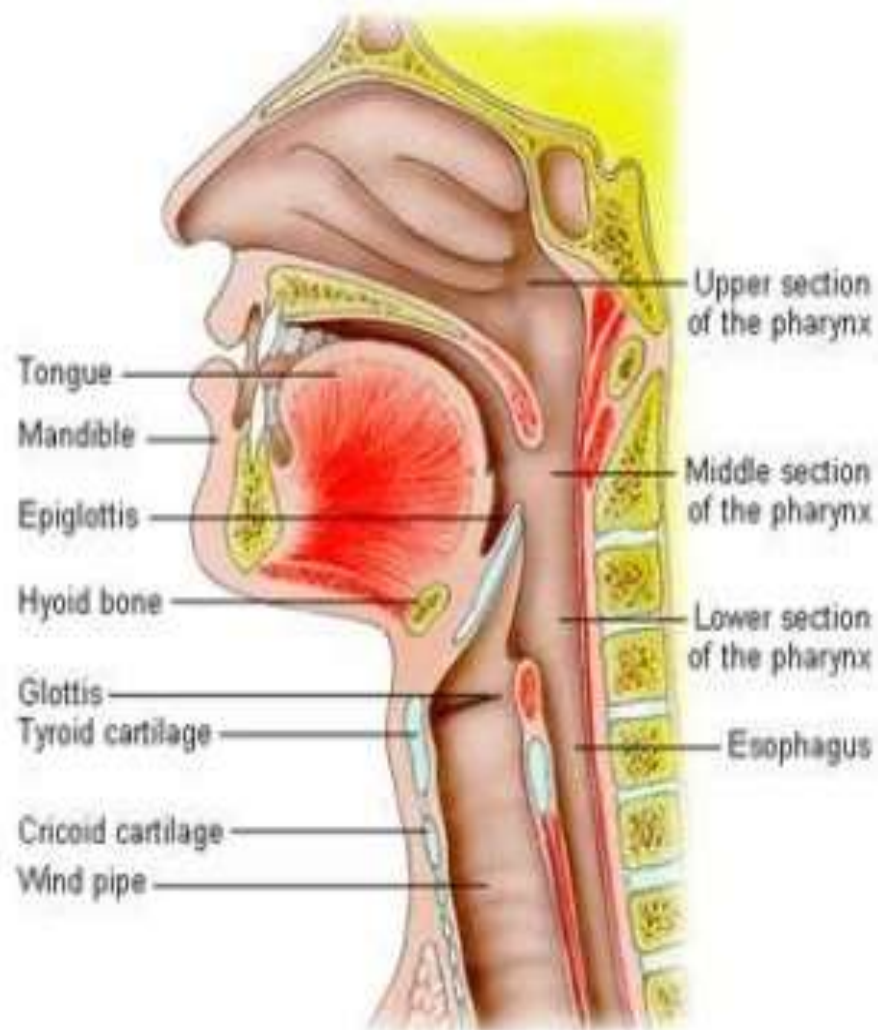
TONGUE

- The upper surface of the tongue has small projections called **papillae**, some of which bear **taste buds**.



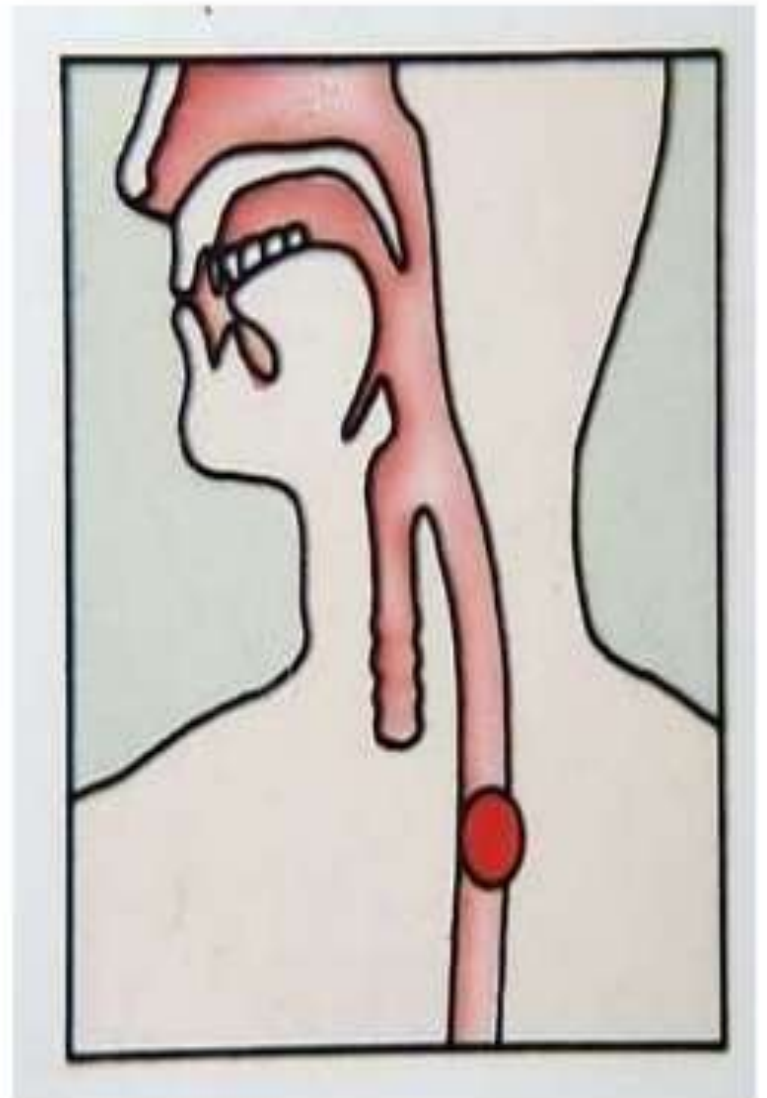
PHARYNX

- Common passage for digestive and respiratory system.
- Opening of oesophagus
- Opening of larynx - **Glottis**



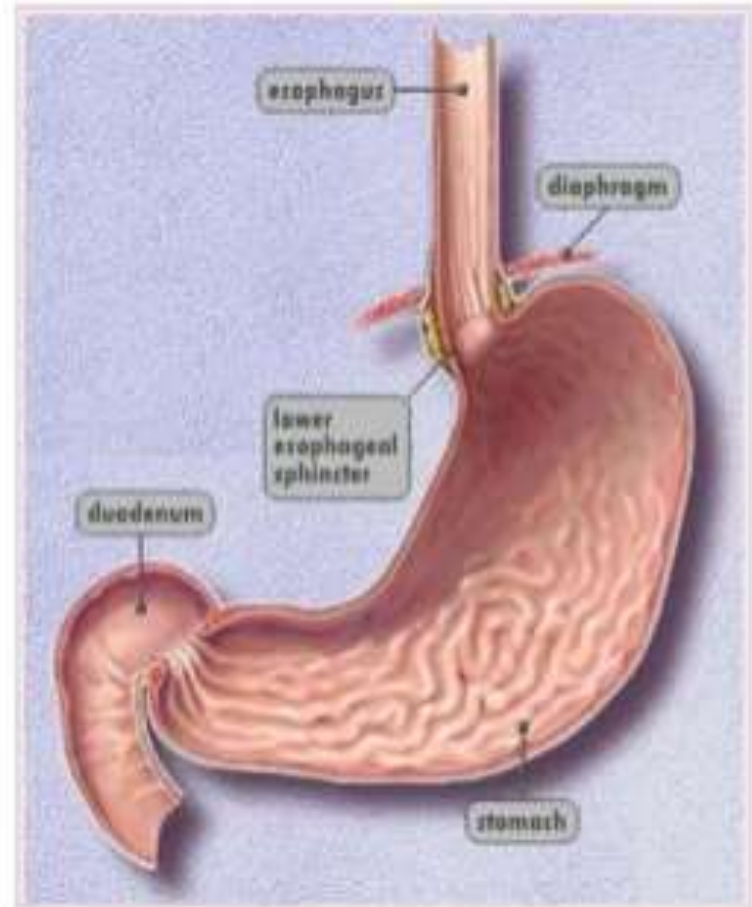
OESOPHAGUS

- Narrow muscular tube
- 30 cm long
- Leads to stomach
- Pass through the **diaphragm** (a muscular partition that separates thorax from abdomen).



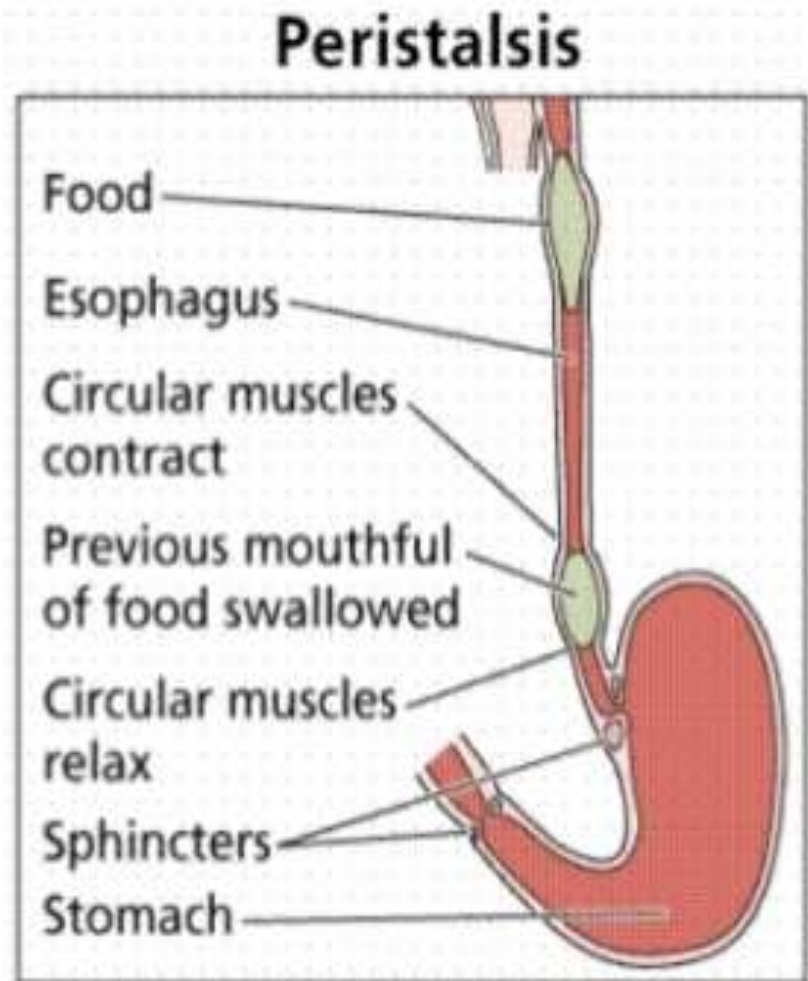
OESOPHAGEAL SPHINCTER (GASTRO OESOPHAGIAL SPHINCTER)

- Posterior region of the oesophagus there is a ring of muscle called oesophageal sphincter.
- It controls the opening of the oesophagus into the stomach.



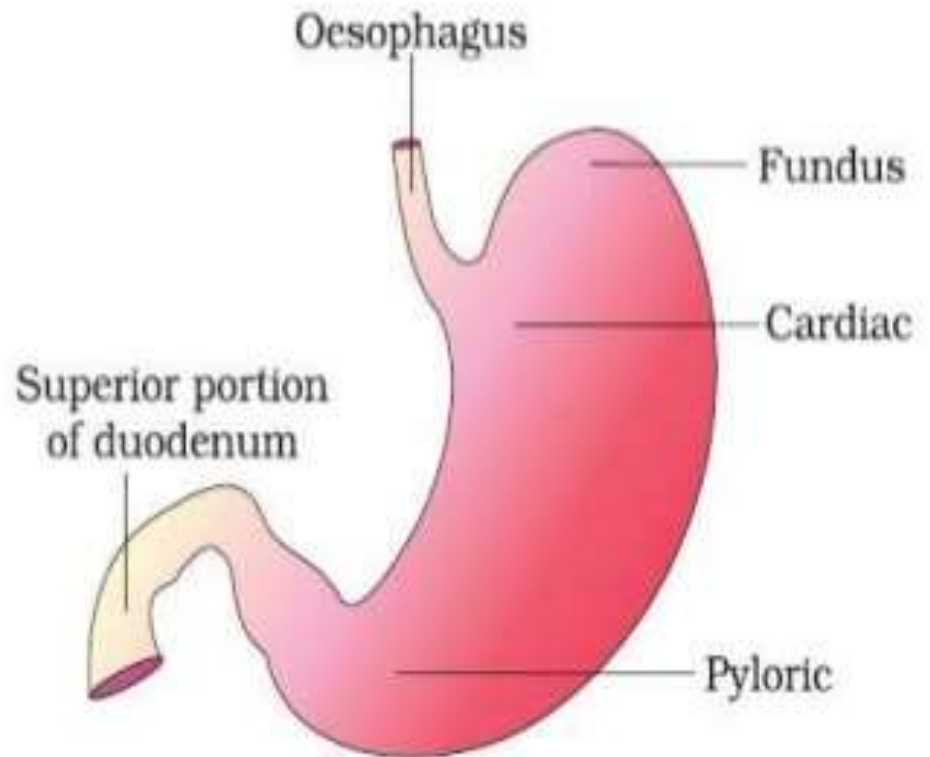
PERISTALSIS

- The movement of food materials in the esophagus is effected by the wave like contraction and relaxation of longitudinal and circular muscles of the esophagus is known as peristalsis.



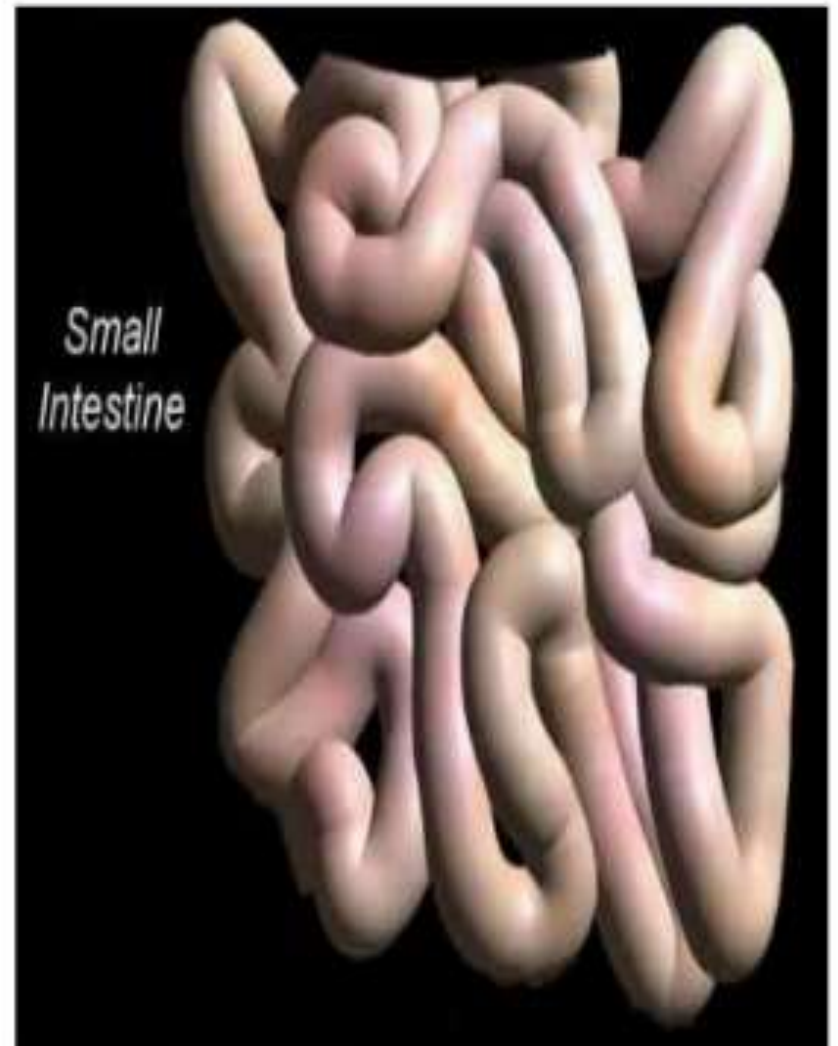
STOMACH

- Large muscular 'J' shaped sac.
- Lying just below the diaphragm in the abdominal cavity.
- Three major parts
 - **Cardiac**
 - **Fundic**
 - **Pyloric**



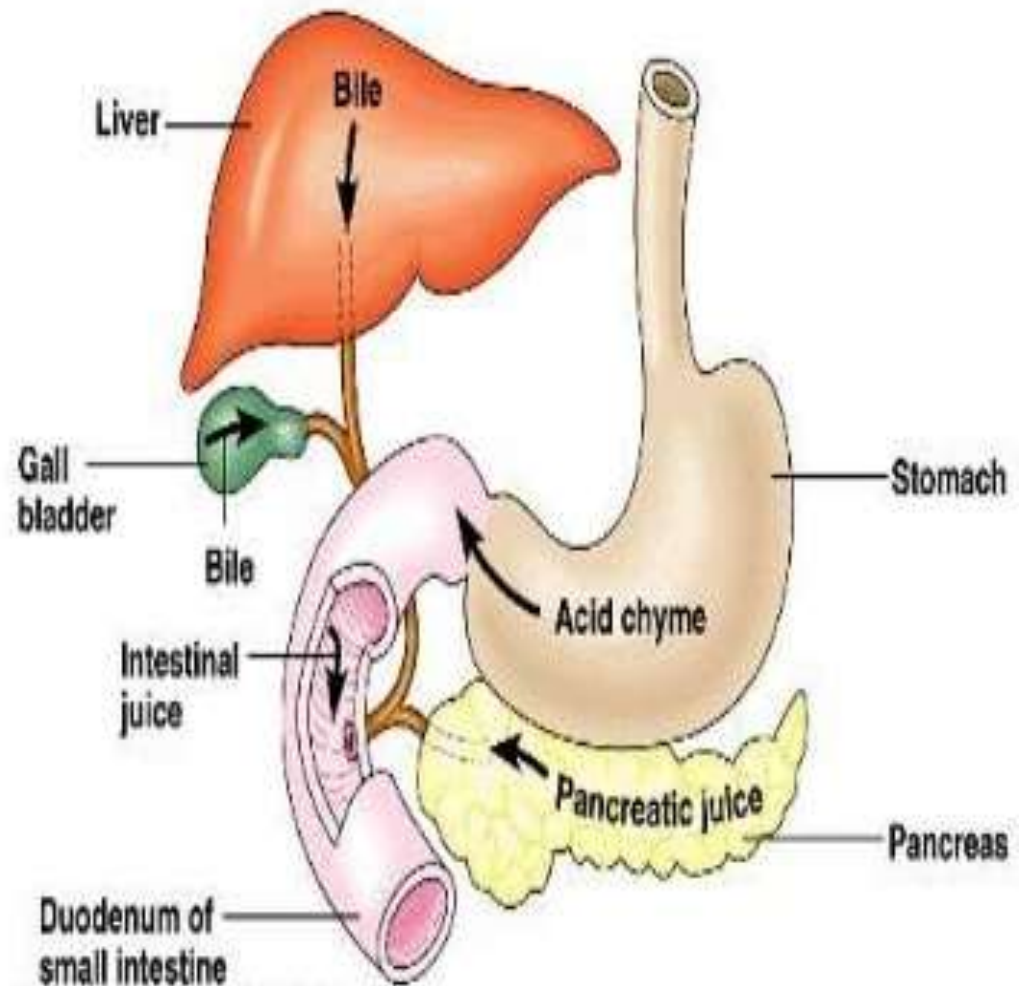
SMALL INTESTINE

- Long, highly coiled, narrow tube
- Seven metres long
- 2.5 cm diameter
- Divided in to **duodenum, jejunum & ileum.**



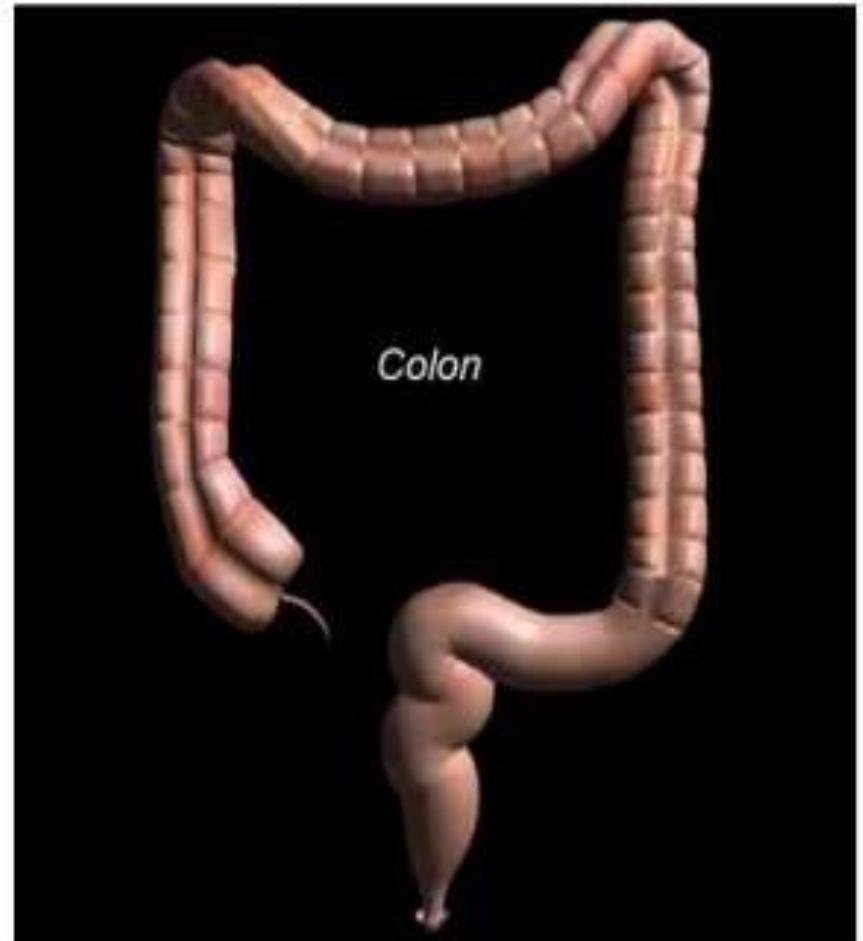
DUODENUM

- First part of SI
- 'U' shaped
- Area of **digestion**
- Receives common opening of the bile and pancreatic duct.

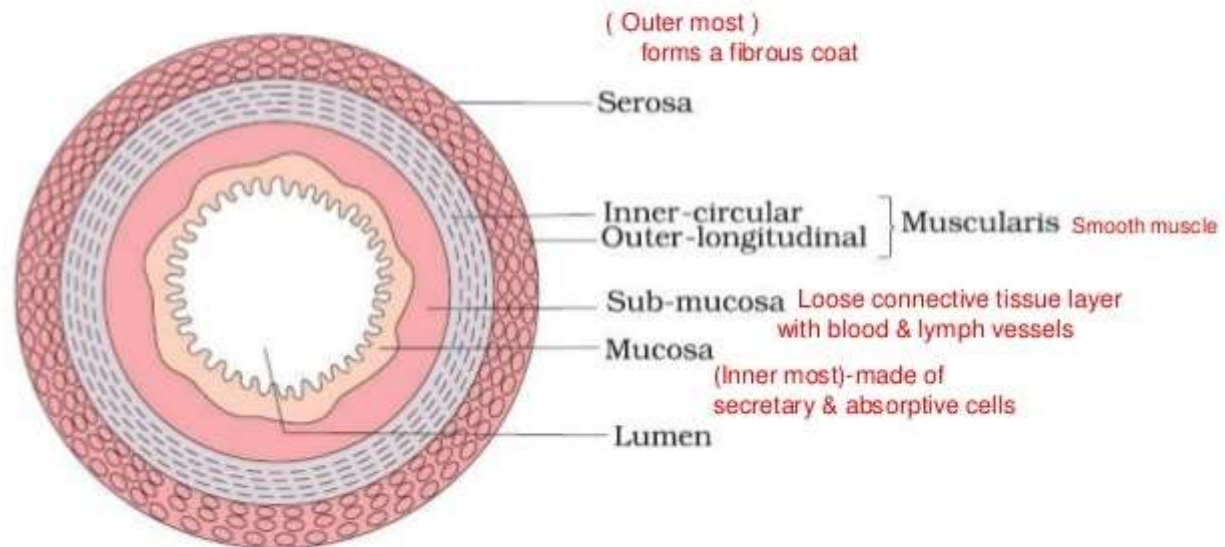


LARGE INTESTINE

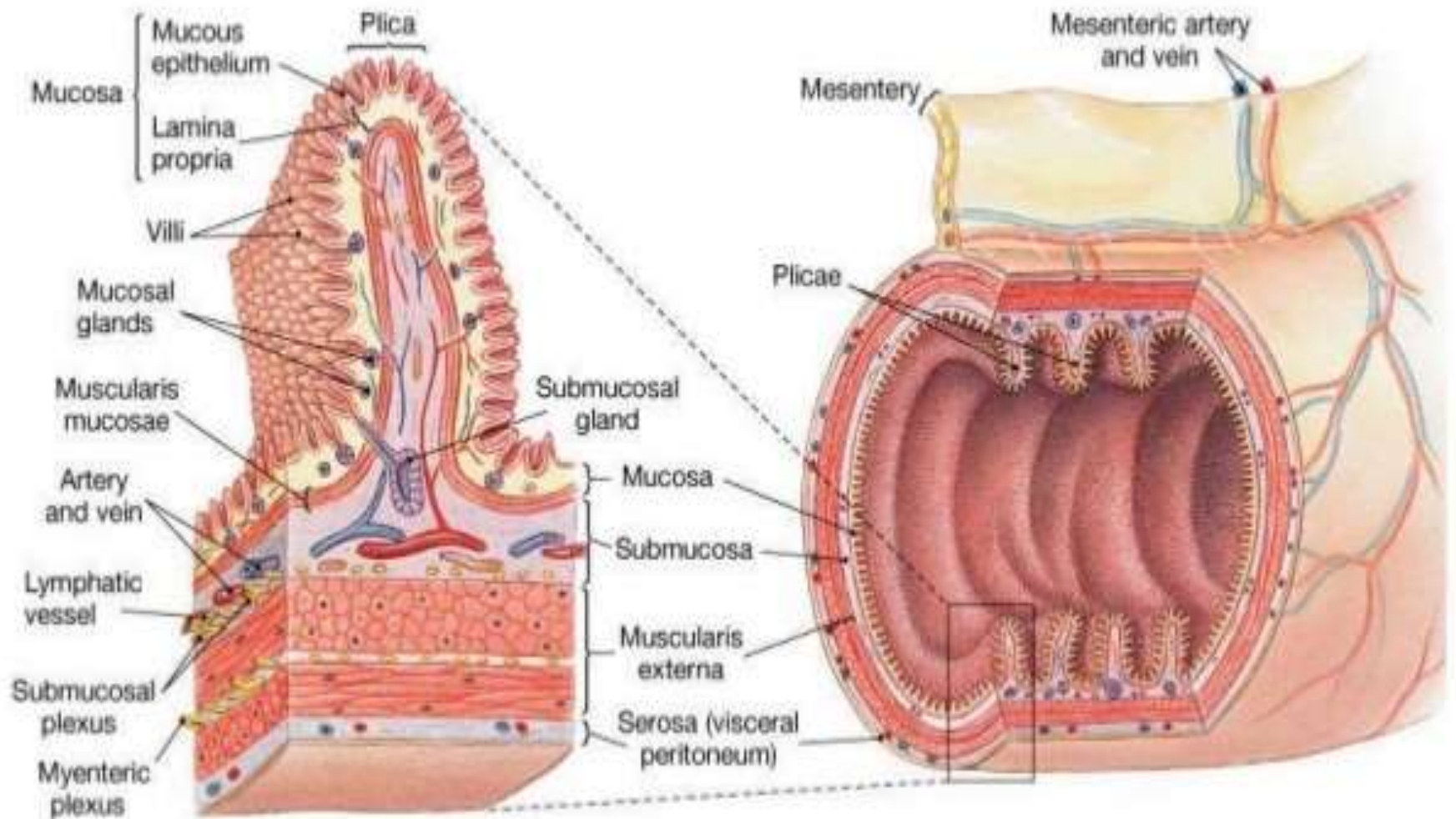
- 1.5 metres long
- Differentiated into **Caecum** , **Colon** & **Rectum**



HISTOLOGY OF HUMAN GUT

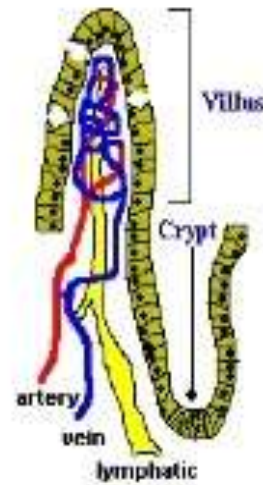


VILLI

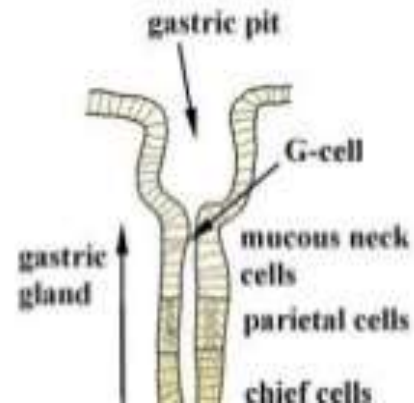
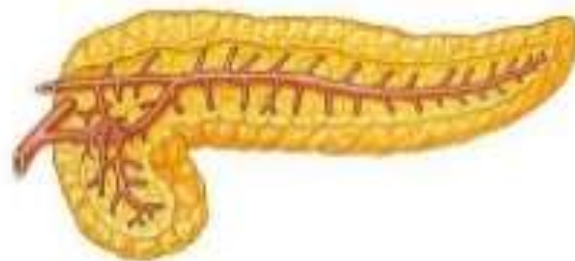


DIGESTIVE GLANDS

- Salivary glands
- Pancreas
- Liver
- Gastric glands
- Intestinal glands



Salivary glands



DIGESTIVE ENZYMES

'ase'

- **Hydrolases**

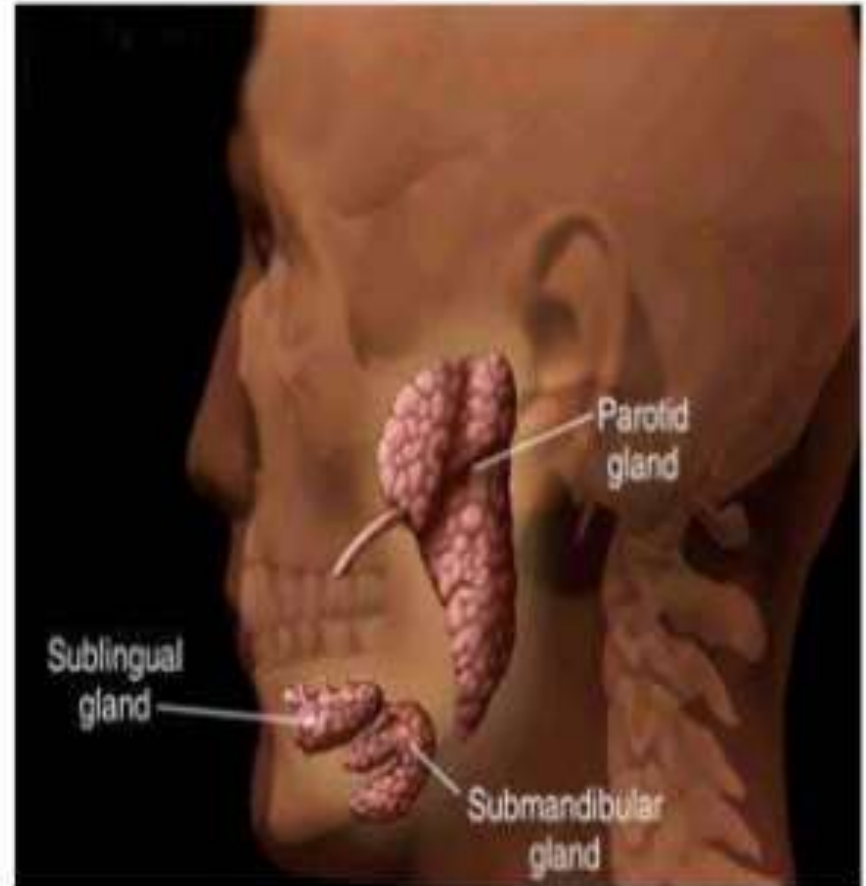
Group of enzymes released from the cells digestive system play a major role in the extra cellular digestion in human



- **Carbohydrase**
amylase) carbohydrate
digesting
E.g.: ptyalin, maltose etc
- **Proteases** (protein
digesting)
Eg: amino peptidase,
dipeptidase
- **Lipase** (lipid digesting)

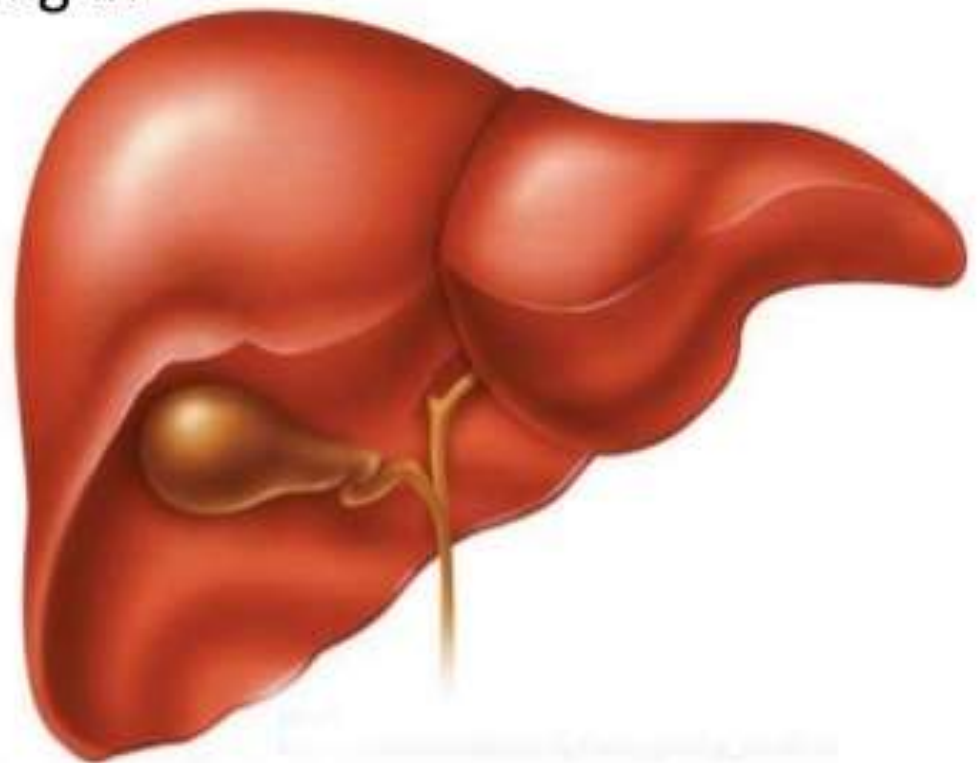
SALIVARY GLANDS

- Secrete saliva
- Found in buccal cavity
- Three pairs of salivary glands
 1. Parotid glands
(largest)
 2. Sub lingual glands
 3. Sub maxillary
(Sub mandibular)



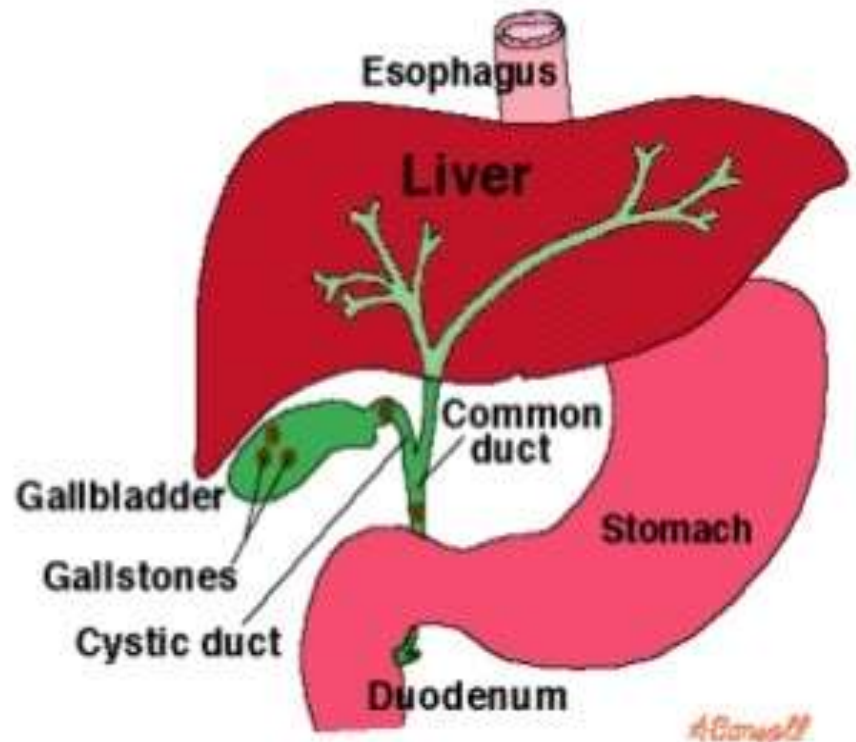
LIVER

- Largest gland in the human body
- Weighs about 1.5 kg in adult man
- Bi lobed
- Secrete bile



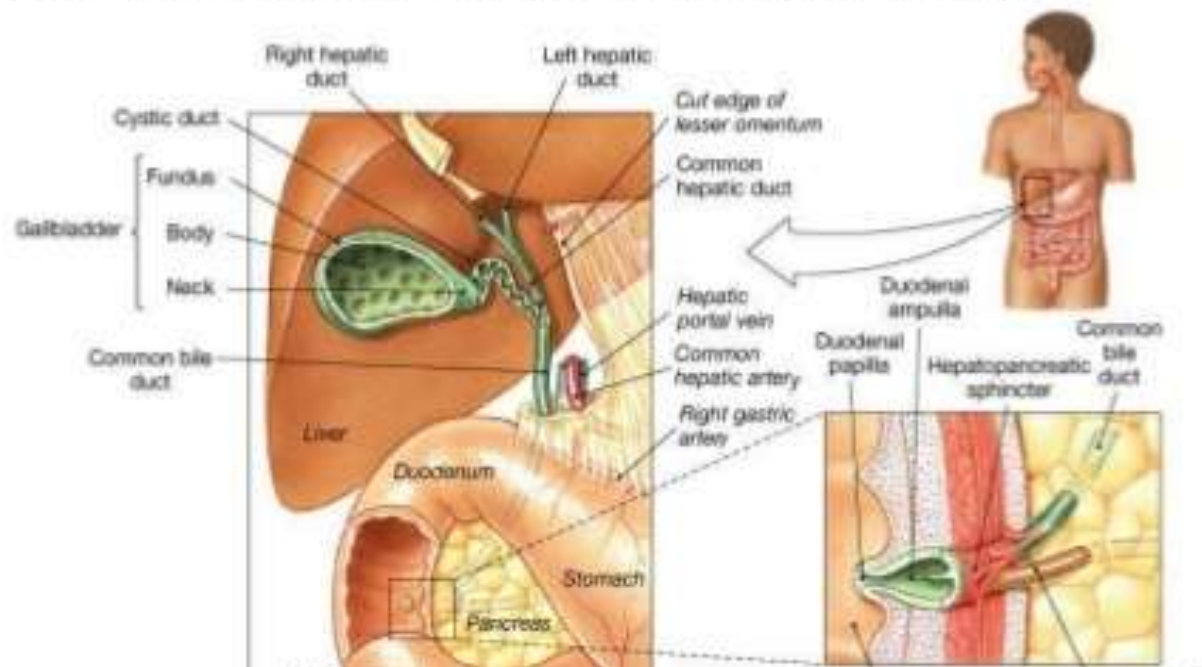
GALL BLADDER

- Bile is stored and concentrated in a thin muscular sac called gall bladder.
- Capacity- 40 – 60 ml
- Absent in whale, horses, rats etc.



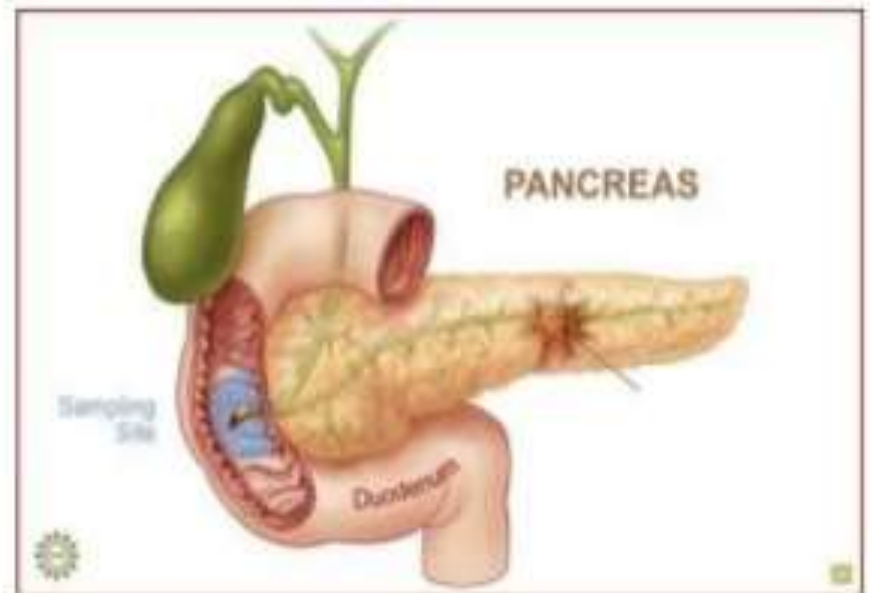
BILE

- Golden yellow or greenish fluid
- Alkaline nature
- Bile pigments (product of dead RBC) (biliverdin & bilirubin)
- Bile salts,
- cholesterol,
- phospholipids
- Bile salts play a very important role in the emulsification of fat



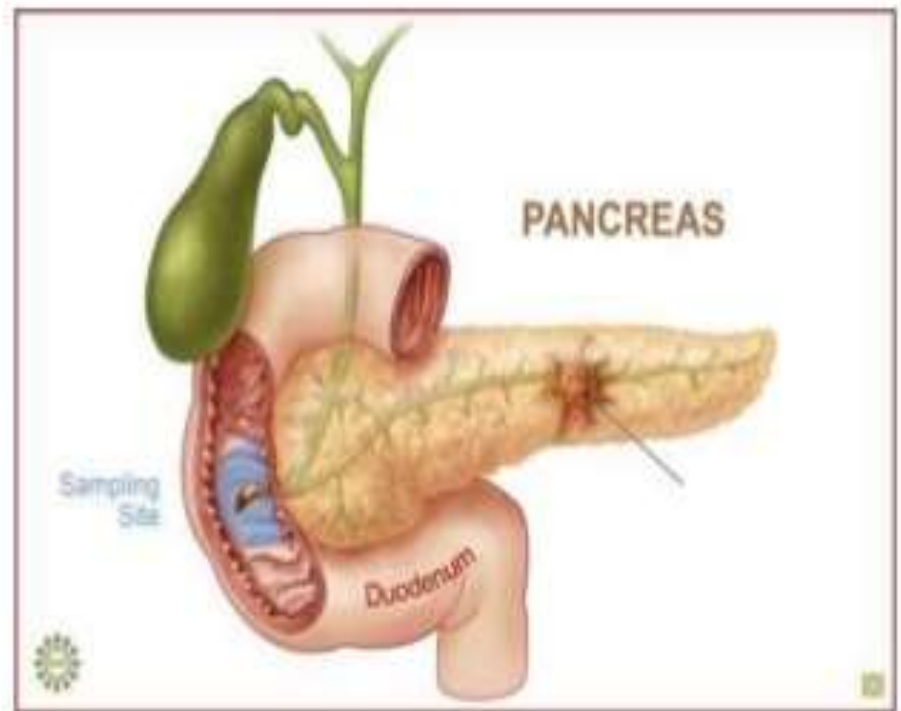
PANCREAS

- Located between stomach & duodenum
- Second largest glands
- **Heterocrine gland** (both exocrine & endocrine)
- Pancreatic duct opens into the duodenum along with bile duct
- Secrete pancreatic juice.



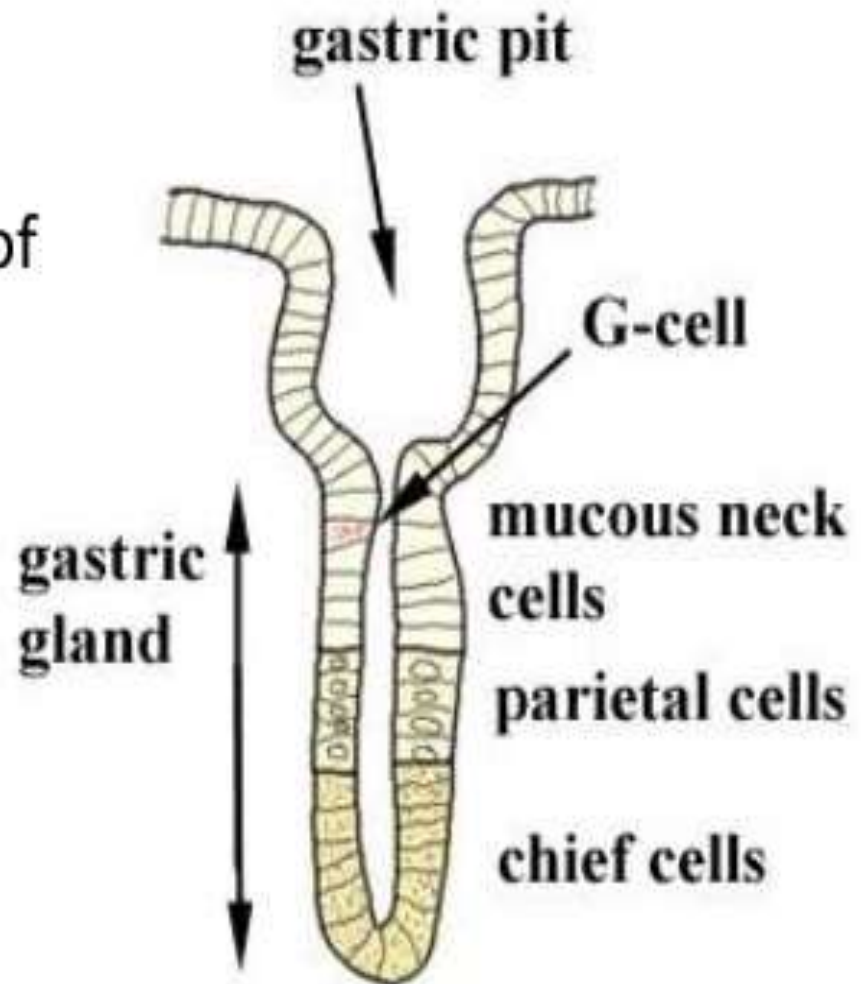
PANCREATIC JUICE

- Alkaline nature
- Trypsinogen ,
Chymotrypsinogen
Proarboxypeptidase,
Amylopsin (p. amylase)
- Steapsin (pancreatic
lipase)
- Nuclease (Nucleic acid
digesting enzyme)



GASTRIC GLANDS

- Found on the wall of stomach
- Formed of three kinds of cells
 1. Mucous cells
 2. Chief cells or Zymogen cells
 3. Oxyntic cells or Parietal cells



GASTRIC SECRETIONS

| Name of Cell | Function |
|---------------------------------|--|
| Mucous cells (Goblet cells) | Secrete mucous |
| Oxyntic cells or Parietal cells | Secretion of HCl and intrinsic factor (factor essential for the absorption of vitamin B12) |
| Chief cells or Zymogen cells | Secretion of enzymes such as pepsin , rennin, lipase etc. |

INTESTINAL GLANDS

- Simple tubular glands found throughout SI
- Two types

Crypts of Lieberkuhn

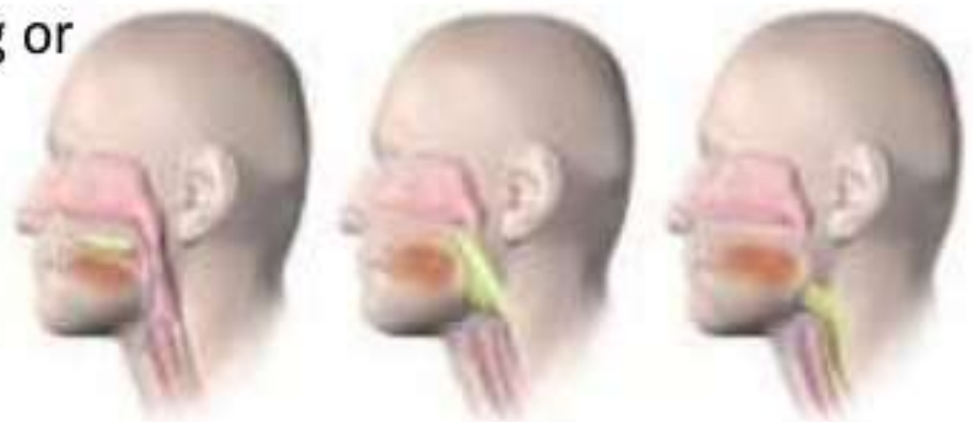
Glands of Brunner

INTESTINAL JUICE (SUCCUS ENTERICUS)

- Collective secretions of intestinal glands
- Alkaline nature
- Contain enzymes , mucous & inorganic salts.
- **Proteases**
Aminopeptidase,
Dipeptidase
- **Amylase**
Maltase, Isomaltase
Lactase, Surcease
- **Lipase**
- **Enterokinase**

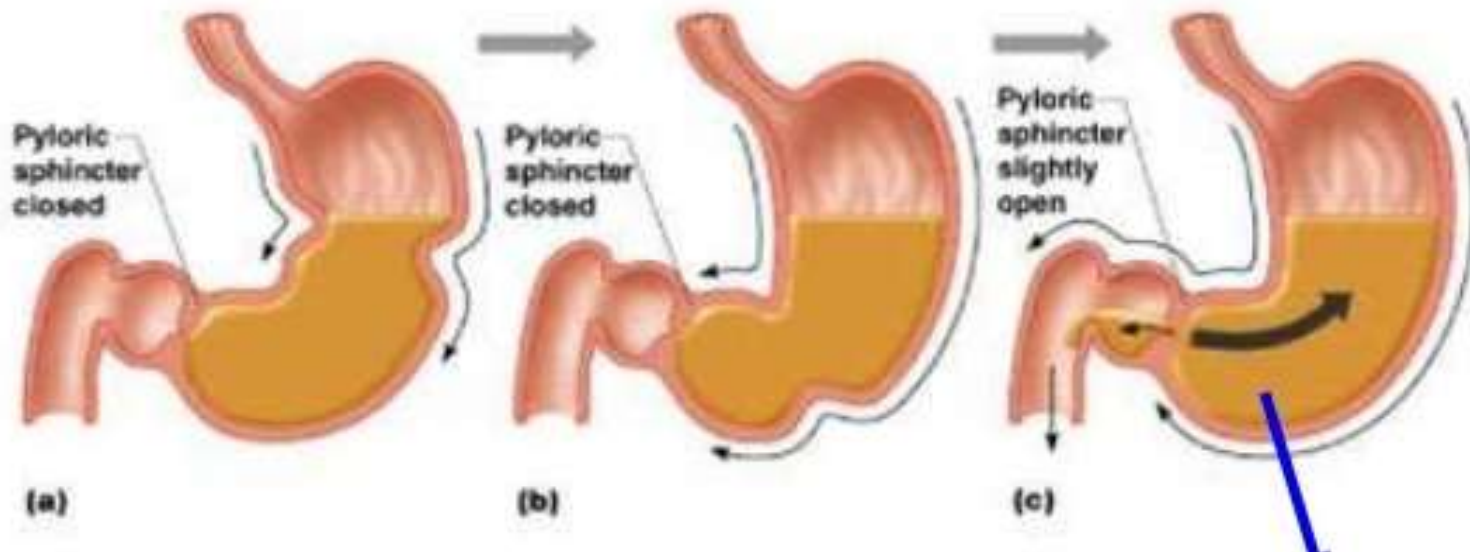
DIGESTION

- The teeth and tongue with the help of saliva masticate and mix up the food into **bolus**.
- The bolus is conveyed to pharynx and then to oesophagus by swallowing or deglutition.

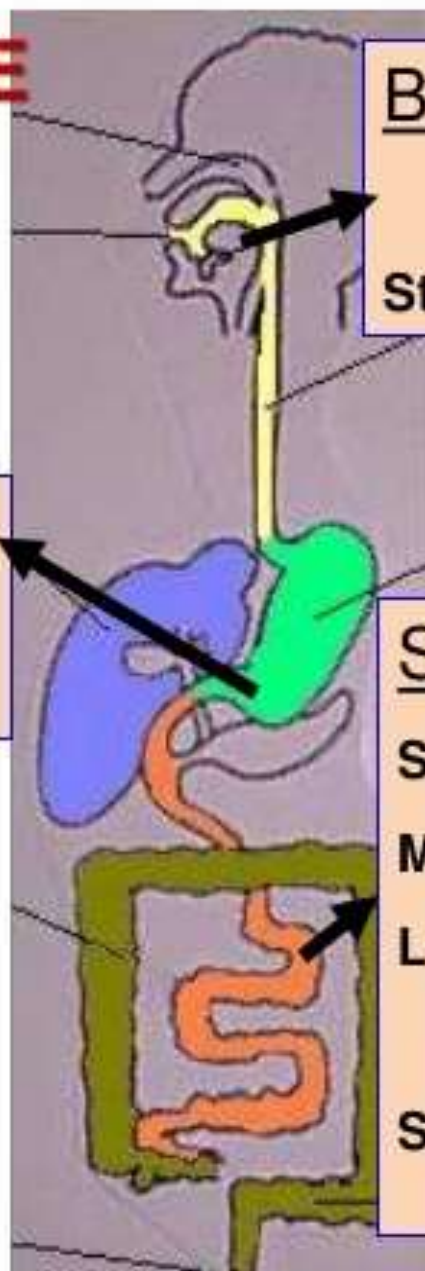


DIGESTION

- The stomach stores the food 4-5 hrs. The food mixes thoroughly with acidic gastric juice to form paste.- **Chyme**



CARBOHYDRATE DIGESTION



Buccal cavity

Salivary amylase

Starch → **Maltose**

Stomach

No carbohydrate digestion

Small Intestine

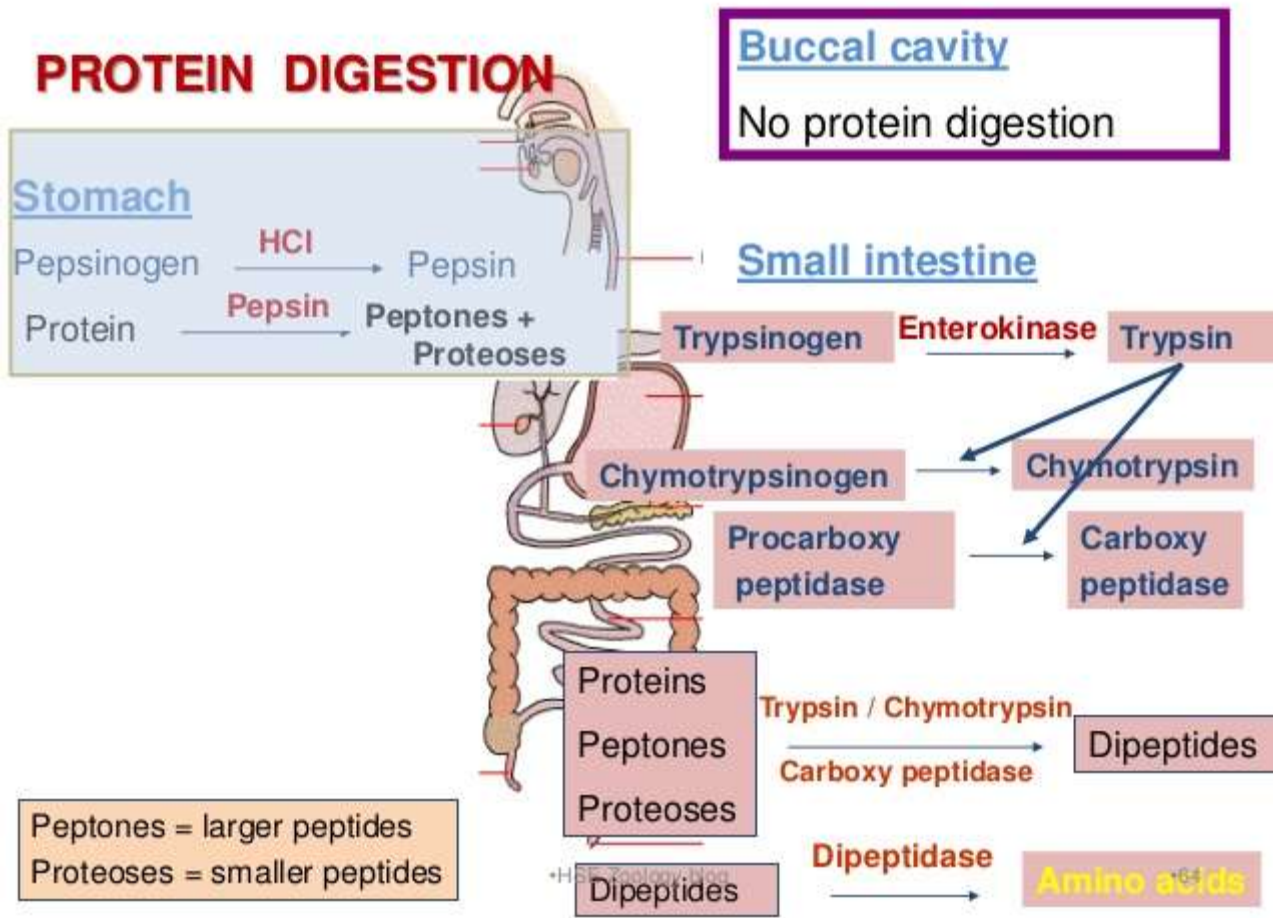
Starch $\xrightarrow{\text{P. amylase}}$ **Maltose**

Maltose $\xrightarrow{\text{Maltase}}$ **2 Glucose**

Lactose $\xrightarrow{\text{Lactase}}$ **Glucose + Galactose**

Sucrose $\xrightarrow{\text{Sucrase}}$ **Glucose + Fructose**

PROTEIN DIGESTION



FAT DIGESTION

Buccal cavity

No protein digestion

Stomach

Gastric lipase hydrolyses only a small amount of fat

Small intestine

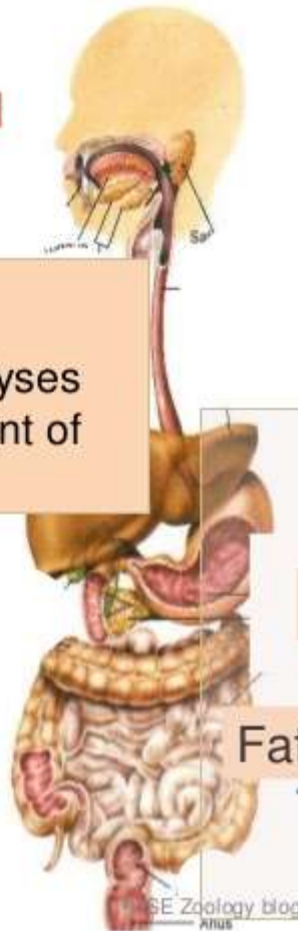
Fat $\xrightarrow{\text{Bile}}$ Fat droplets

Emulsification

Fat $\xrightarrow{\text{Pancreatic lipase}}$ Diglyceride

Monoglycerides

Fatty acids & Glycerol

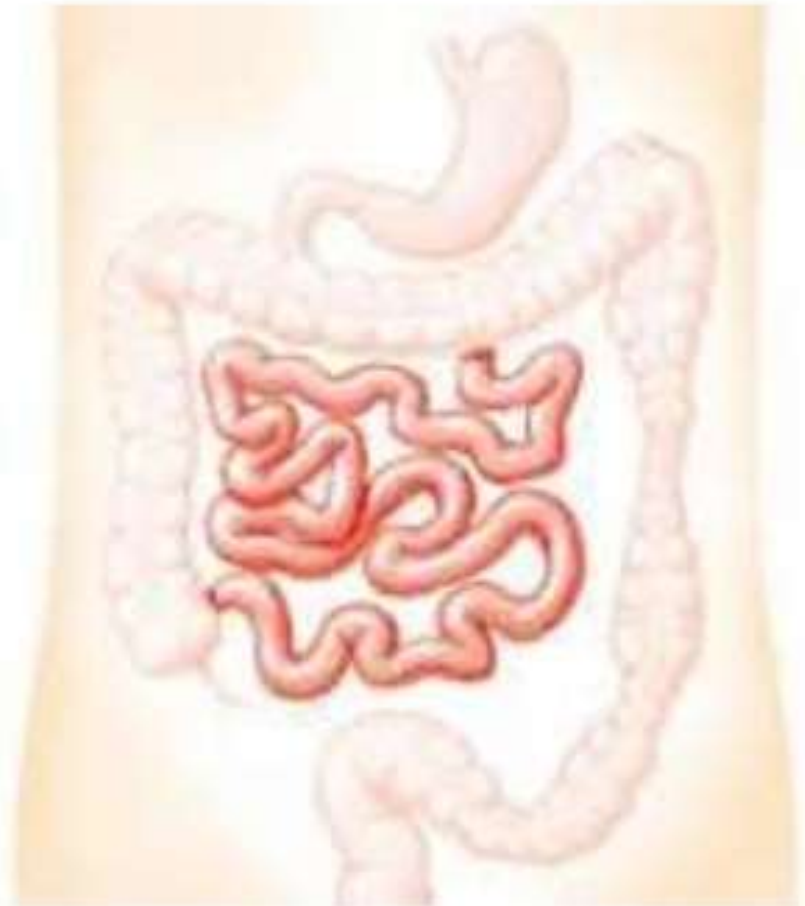


END PRODUCTS OF DIGESTION

| | |
|---------------|----------------------------------|
| Carbohydrates | Glucose Fructose Galactose |
| Proteins | Amino acids |
| Fats | Fatty acids glycerol |

ABSORPTION OF DIGESTED PRODUCTS

- Absorption is the process by which the end products of digestion pass through the intestinal mucosa (**transported through the intestinal mucosa**) into the blood or lymph
- The end products of digestion are absorbed in the jejunum and ileum regions of small intestine.



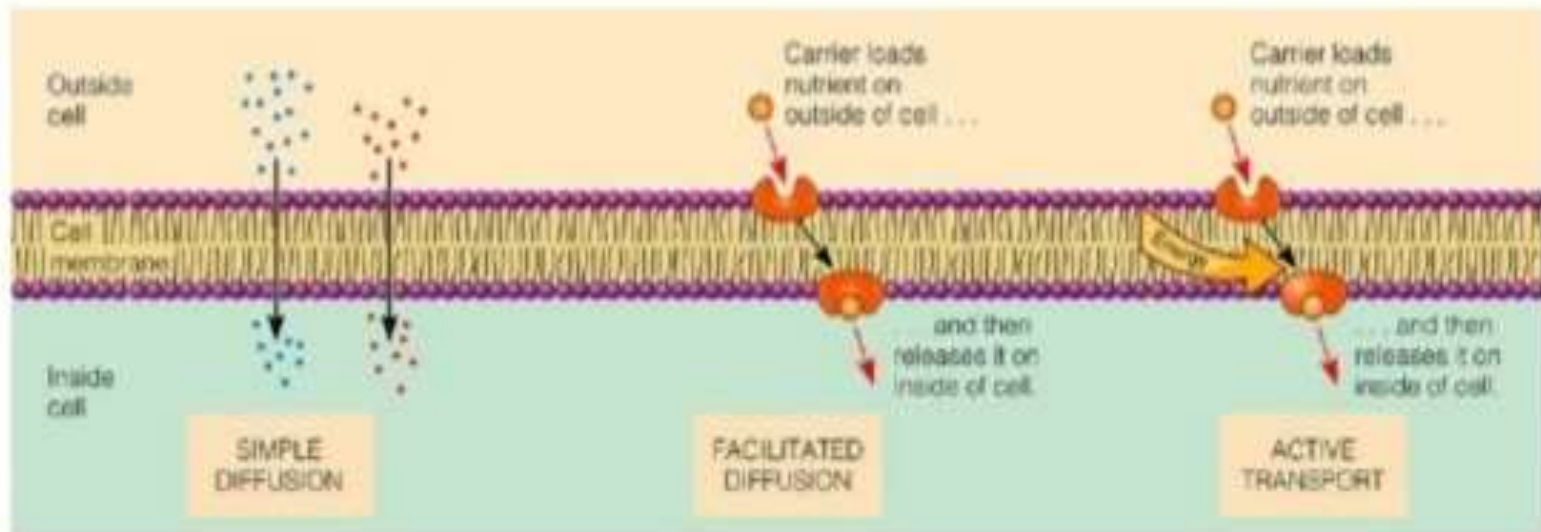
ABSORPTION

Absorption is carried out by

- Passive transport
- Facilitated transport
- Active transport

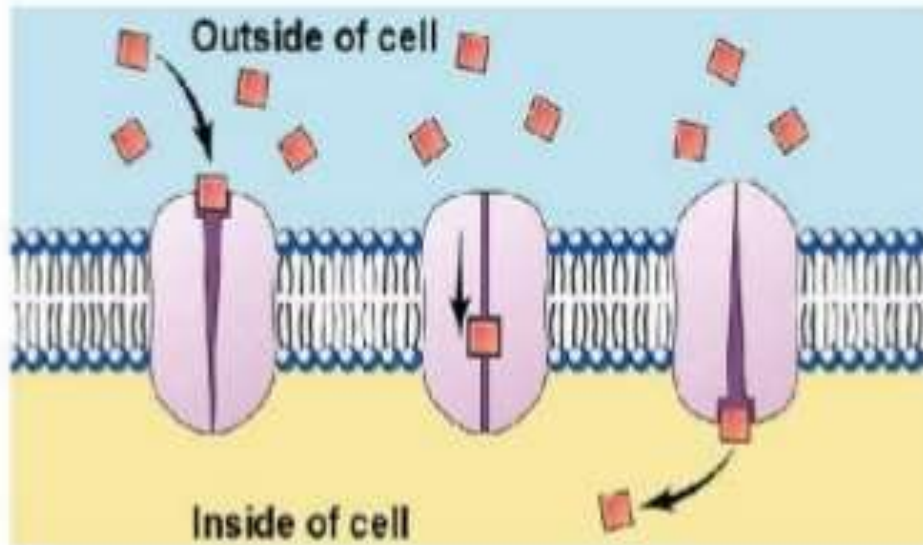
PASSIVE TRANSPORT

- Small amounts of monosaccharide like glucose, amino acids, and some of electrolytes like chloride ions are generally absorbed by simple diffusion.



FACILITATED TRANSPORT

Facilitated Diffusion

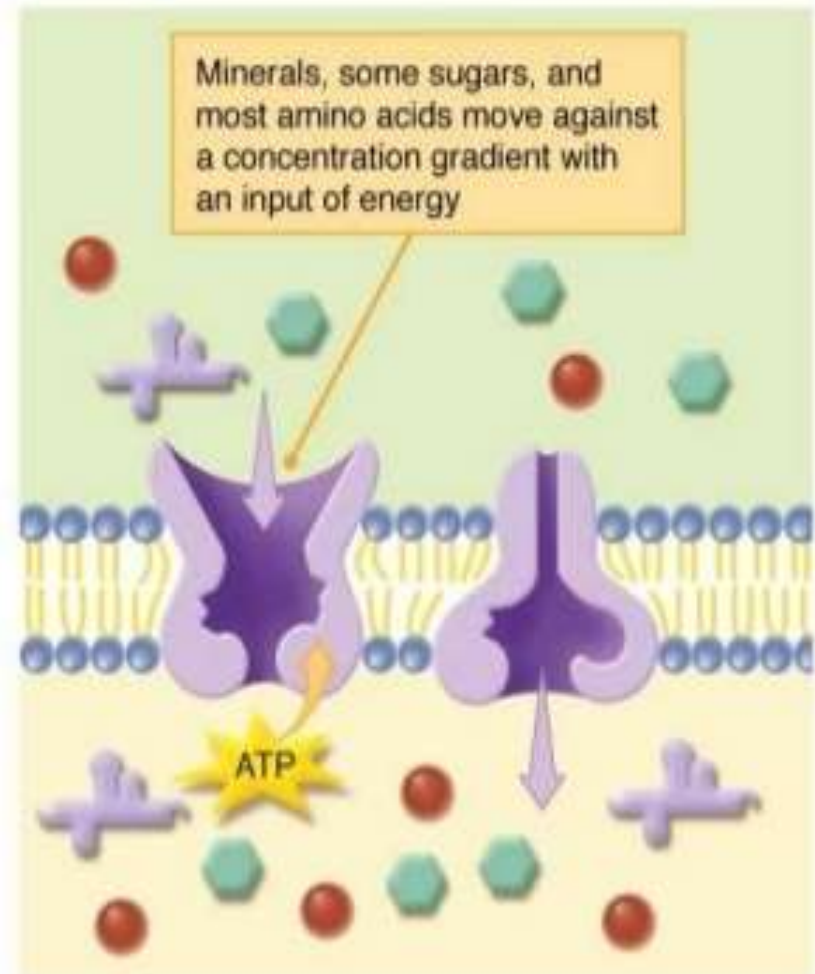


- Fructose and some amino acids are absorbed with the help of carrier ions like sodium. This mechanism is called facilitated transport.

ACTIVE TRANSPORT

- Requires energy
- Various nutrients like amino acids, monosaccharide like glucose, electrolytes like Na^+ are reabsorbed into the blood by active transport.

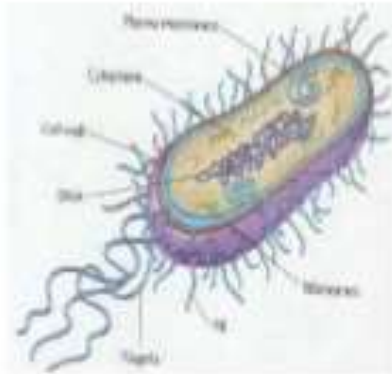
ACTIVE TRANSPORT



THE SUMMARY OF ABSORPTION IN DIFFERENT PARTS OF DIGESTIVE SYSTEM

| Oral cavity | Stomach | Small Intestine | Large Intestine |
|--|-------------------------------|--|------------------------------|
| Certain drugs coming in contact with the mucosa of the mouth and lower side of the tongue are absorbed into the blood capillaries lining them. | Water, simple sugars, alcohol | Glucose Fructose Fatty acids Glycerol Amino acids | Water , some minerals, drugs |

DISORDERS OF DIGESTIVE SYSTEM



Bacteria



Tape worm

- Infections of the digestive system are caused by **bacteria, virus, parasites like tape worm, thread worm, round worm, hook worm, pinworm etc.**



Virus



Pinworm



Thread worm

VOMITING

- It is the ejection of stomach content through the mouth.



DIARRHOEA

- The abnormal frequency of bowel movement and increased liquidity of faecal discharge is known as diarrhoea.
- It reduces the absorption of food.



JAUNDICE

- The liver is affected, skin, eyes turn yellow due to the deposition of bile pigments.



CONSTIPATION

- The faeces are retained within the rectum as the bowel movement occurs irregularly.



INDIGESTION

- The food is not properly digested leading to the feeling of fullness.
- The cause of indigestion are inadequate enzyme secretion, anxiety, food poisoning, overeating and spicy food.

